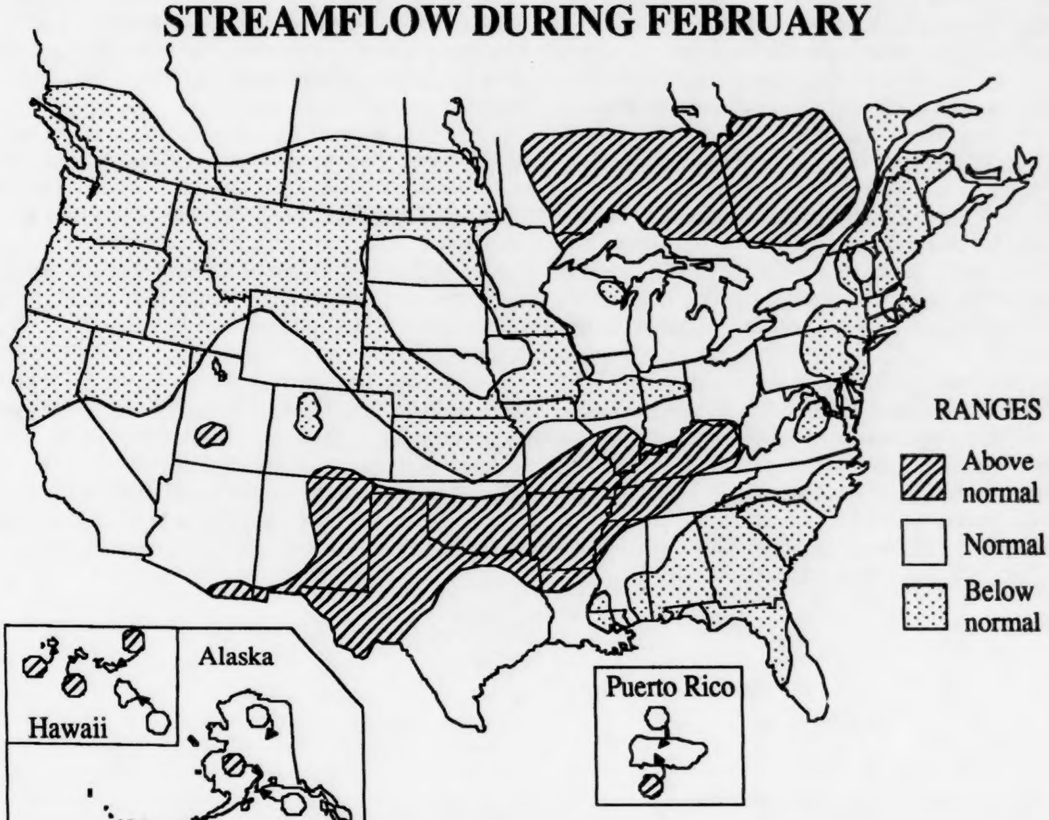
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

FEBRUARY 1989

STREAMFLOW DURING FEBRUARY



Heavy rains February 13-16 caused flooding in west-central Kentucky. Estimated peak discharges with recurrence intervals of about 100 years occurred on the Rolling Fork (Salt River basin) and the Kentucky River downstream from Lock 6.

Streamflow was in the normal to above-normal range at 61 percent of the index stations in southern Canada, the United States, and Puerto Rico during February. Total February flow in the conterminous United States and southern Canada was 5 percent above median after a 5 percent increase in streamflow from January to February. Below-normal range streamflow occurred in 36 percent of southern Canada and the conterminous United States during February compared with 25 percent during January.

February streamflow ranged from 66 percent below median to 11 percent above median in five areas affected by drought. Flow was the same as during January in the Northern Great Plains, but decreases in the other four areas ranged from 5-20 percent.

The combined flow of the 3 largest rivers in the lower 48 States--Mississippi, St. Lawrence, and Columbia--was in the normal range during February.

Monthend index reservoir contents for February 1989 were in the below-average range at 34 of 100 reporting sites, compared with 33 of 97 during January 1989.

Mean February elevations at the four master gages on the Great Lakes (provisional National Ocean Service data) were in the normal range except on Lake Ontario, where the mean was in the below-normal range.

Utah's Great Salt Lake rose 0.10 foot during February.

SURFACE-WATER CONDITIONS DURING FEBRUARY 1989

Hydrologic drought continued to affect some parts of the United States despite above-normal precipitation over a large area of the Nation. Storage remained well below the average for this time of year in California's major reservoirs and the runoff outlook was below average. Soil moisture is generally very low in both Oregon and Washington, while the snowpack is above average (120-160 percent) in Oregon and below average (85-90 percent) in Washington. The mixed conditions cited for Oregon and Washington also occur in other western states to varying degrees. In Idaho, flow of the Snake River near Weiser was in the below-normal range for the 25th consecutive month, despite a 35 percent increase in discharge from January to February. In Monta, flow of the Clark River at St. Regis was in the below-normal range for the 9th consecutive month and flow of the Yellowstone River at Corwin Springs, on the east side of the Continental Divide, was in the below-normal range for the 10th consecutive month. Storage in the New York City reservoir system remained below average and streamflow in the Southeast decreased despite heavy rains over inland areas during February.

Streamflow was in the normal to above-normal range at 61 percent of the 191 reporting index stations in southern Canada, the United States, and Puerto Rico, during February the same as during last month. This is the lowest percentage of stations with flow in the normal to above-normal range for February in the last 7 years. Total February flow of 2,122,700 cubic feet per second (cfs) for the 181 reporting index stations in the conterminous United States and southern Canada was 5 percent above median after a 5 percent increase in streamflow from January to February. Below-normal range streamflow occurred in 36 percent of southern Canada and the conterminous United States during February compared with 25 percent during January.

New monthly extremes occurred at seven index stations during February (table on page 4)—five lows (one each in New York, South Carolina, Georgia, Florida, and Nebraska) and three highs (two in Kentucky and one in Arkansas)—compared with none last month. Hydrographs for seven index stations, a site in the Canadian southwest and six of the sites at which new extremes occurred, are on page 5.

February streamflow ranged from 66 percent below median (California) to 11 percent above median (Western Great Lakes) in five areas (graphs on page 6) affected by drought. Flow was the same as during January in the Northern Great Plains, but decreases in the other four areas ranged from 5 percent in the Southeast to 20 percent in California. Graphs of actual streamflow in the five areas for each month of the 1988 and 1989 water years, and also 1951-80 median streamflow for each month are on page 7.

The combined flow of the 3 largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia—averaged a normal-range 1,162,700 cfs (12 percent above median) during February—4 percent less than during January. Flow of both the St. Lawrence River and the Mississippi River was in the normal range. Flow of the Columbia River was 42 percent below median and in the below-normal range for the third consecutive

(Continued on page 4)

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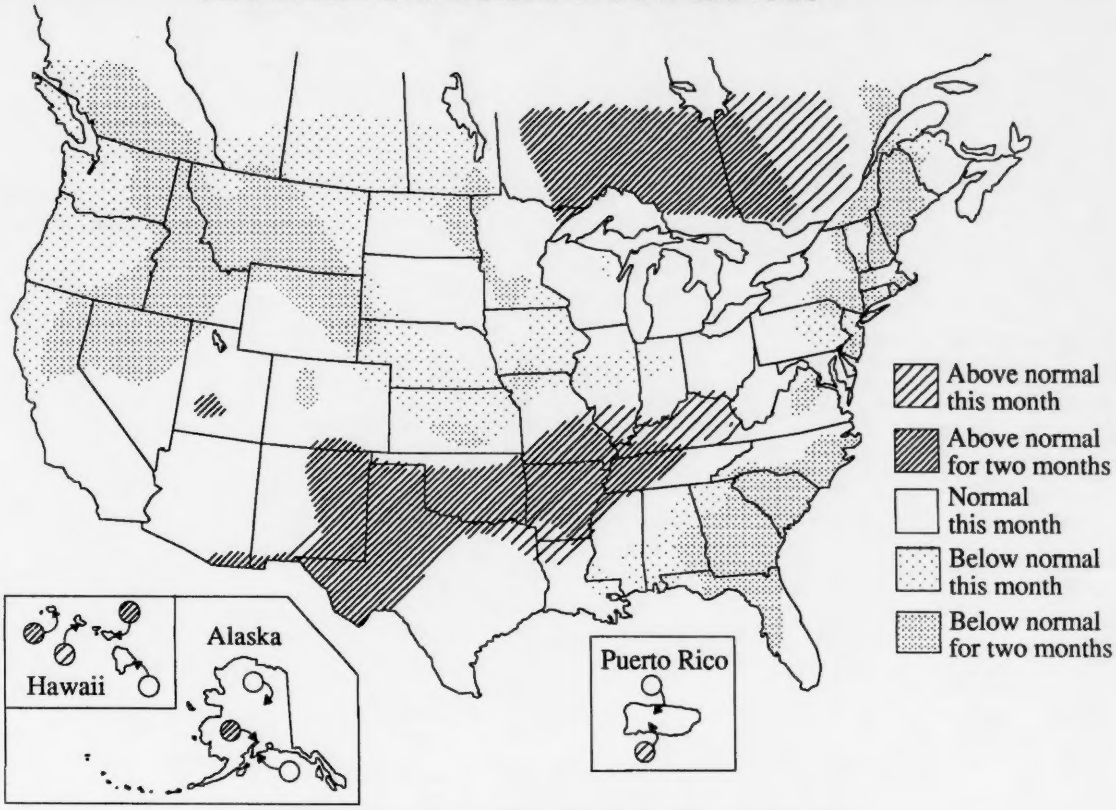
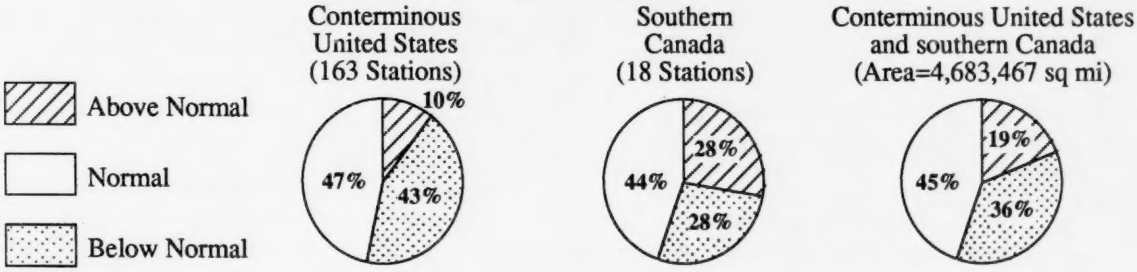
FEBRUARY 1989 STREAMFLOW RANGES

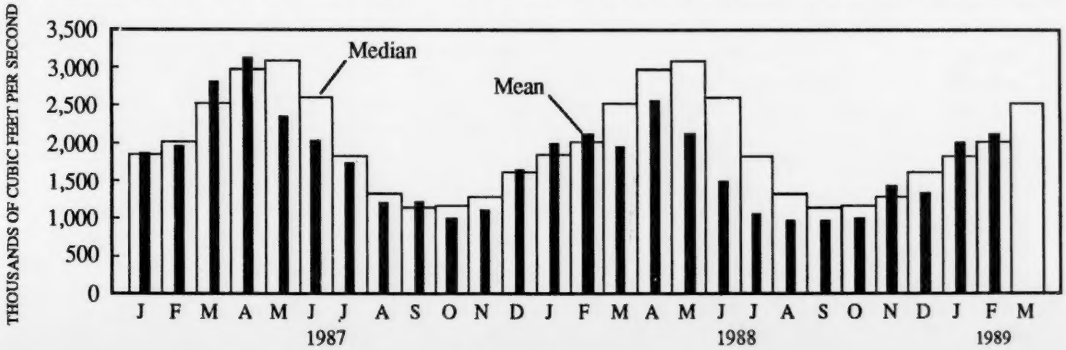


SUMMARY OF FEBRUARY 1989 STREAMFLOW

FLOW RANGES



COMPARISON OF TOTAL MONTHLY MEANS WITH TOTAL MONTHLY MEDIANS



NEW EXTREMES DURING FEBRUARY 1989 AT STREAMFLOW INDEX STATIONS

Station number	Stream and place of determination	Drainage area (square miles)	Years of record	Previous February extremes (period of record): Monthly mean in cfs (year)	Previous February extremes (period of record): Daily mean in cfs (year)	February 1989: Monthly mean in cfs	February 1989: Percent of median	February 1989: Daily mean in cfs	February 1989: Day
	LOW FLOWS								
1309500	Massapequa Creek at Massapequa, N.Y.	38	52	4.26 (1967)	1.90 (1966)	3.71	29	2.30	8
2173500	North Fork Edisto River at Orangeburg, S.C.	683	50	512 (1957)	420 (1956)	505	51	419	18
2226000	Altamaha River at Doctortown, Ga.	13,600	57	5,800 (1938)	2,900 (1981)	4,452	20	3,320	21
2358000	Apalachicola River at Chattahoochee, Fla.	17,200	60	11,230 (1934)	8,280 (1956)	10,250	32	8,840	24
6454500	Niobrara River above Box Butte Reservoir, Nebr.	1,400	42	23.0 (1988)	10.0 (1949)	21.6	54	17.0	1
	HIGH FLOWS								
3253500	Licking River at Catawba, Ky.	3,300	62	23,150 (1956)	62,800 (1948)	25,100	380	70,500	17
3308500	Green River at Munfordville, Ky.	1,673	62	16,700 (1956)	69,400 (1962)	16,930	405	42,600	16
7056000	Buffalo River near St. Joe, Ark.	829	49	4,985 (1951)	48,000 (1985)	5,541	592	29,700	14

month. Hydrographs for both the combined and individual flows of the "Big 3" are on page 8. Dissolved solids and water temperatures at five large river stations are also given on page 8. Flow data for the "Big 3" and 42 other large rivers are given in the Flow of Large Rivers table on page 9.

Monthend index reservoir contents for February 1989 were in the below-average range (below the monthend average for the period of record by more than 5 percent of normal maximum contents) at 34 of 100 reporting sites, compared with 33 of 97 during January 1989, including most reservoirs in Nova Scotia, Maryland, the Dakotas, Montana, Wyoming, Idaho, Washington, California, and Nevada. Lake Tahoe, straddling California and Nevada, had no usable storage for the fifth consecutive month. February 1989 contents were significantly lower than those of February 1988 at 40 of the 100 sites, including most sites in the Dakotas, Montana, Wyoming, California, Nevada, and Texas. In the Southeast, only 2 of the 10 index reservoirs with capacities greater than 1,000,000 acre-feet had contents which were less than those of February 1986, the most recent year of drought in that area prior to 1988. Graphs of contents for seven reservoirs are shown on page 10 with contents for the 100 reporting reservoirs given on page 11.

Mean February elevations at the four master gages on the Great Lakes (provisional National Ocean Service data) declined from those for January on Lake Superior and Lake Huron, and rose on Lake Erie and Lake Ontario. The monthly means were in the normal range except on Lake Ontario, where the mean was in the below-normal range for the second consecutive month. February 1989 levels ranged from 0.37 foot higher (Lake Superior) to 0.89 foot lower (Lake Huron) than those for February 1988. Stage hydrographs for the master gages on Lake Superior, Lake Huron, Lake Erie, and Lake Ontario are on page 14.

Utah's Great Salt Lake (graph on page 14) rose 0.10 foot to 4,206.60 feet above National Geodetic Vertical Datum of 1929 on February 28. Lake level was 2.95 feet higher at the end of February 1988.

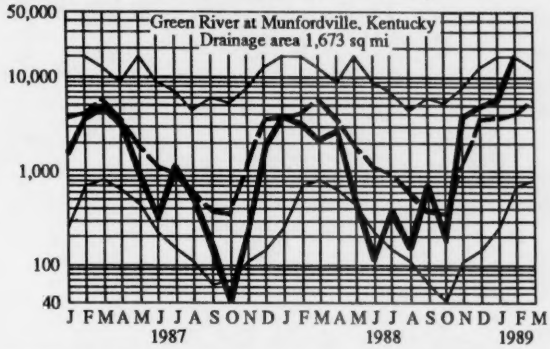
Precipitation in the United States during February 1989 (provisional National Weather Service map on page 15) was more than 200 percent of normal in two large areas; one extending from central Wyoming to northern New Mexico; the other extending from southeastern New Mexico/western Texas to southern Ohio/western West Virginia.

Winter (November 1988-February 1989) was generally dry over large areas of the United States according to the NOAA/USDA Joint Agricultural Weather Facility (pages 16-17). February 1989 (page 18) was the eighth coldest February since 1895 with precipitation below the median for the month.

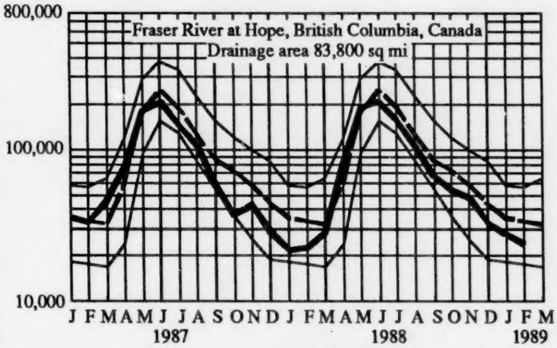
March-May 1989 outlook maps for both temperature and precipitation are on page 15. Precipitation is likely to be above median in much of California, in southwestern Oregon, and also in an area south of the Great Lakes and north of Kentucky.

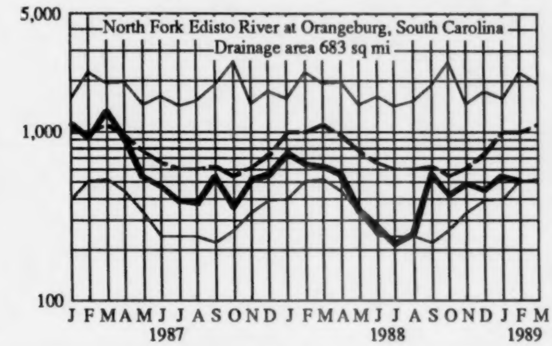
MONTHLY MEAN DISCHARGE OF SELECTED STREAMS

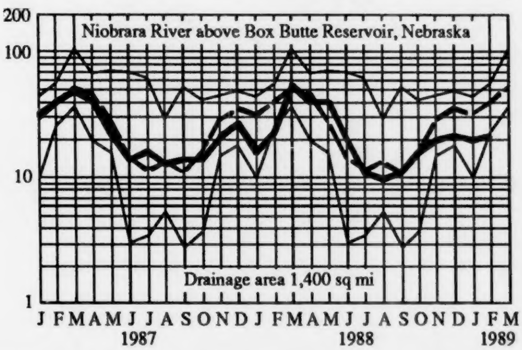
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.

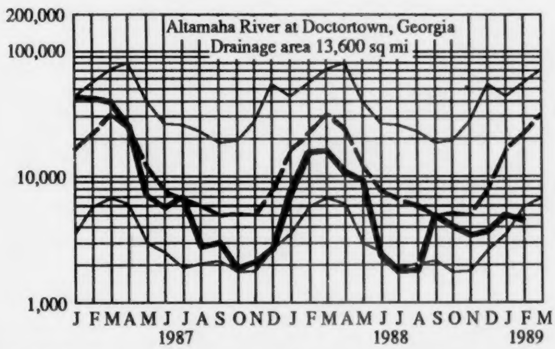


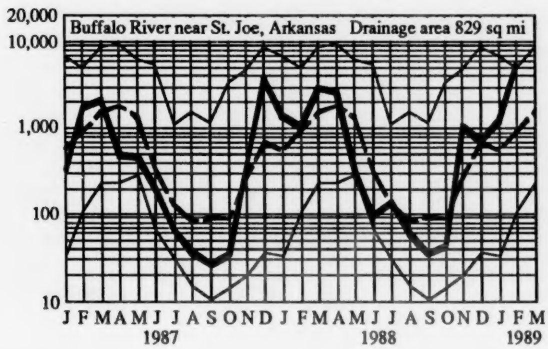
DISCHARGE IN CUBIC FEET PER SECOND

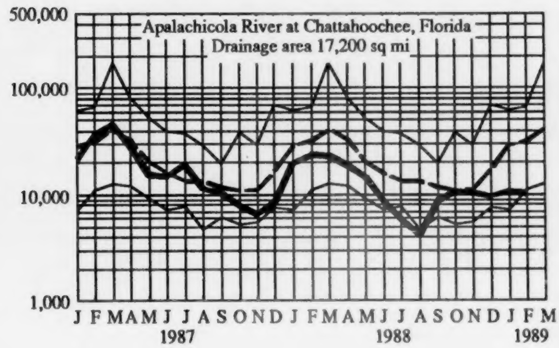




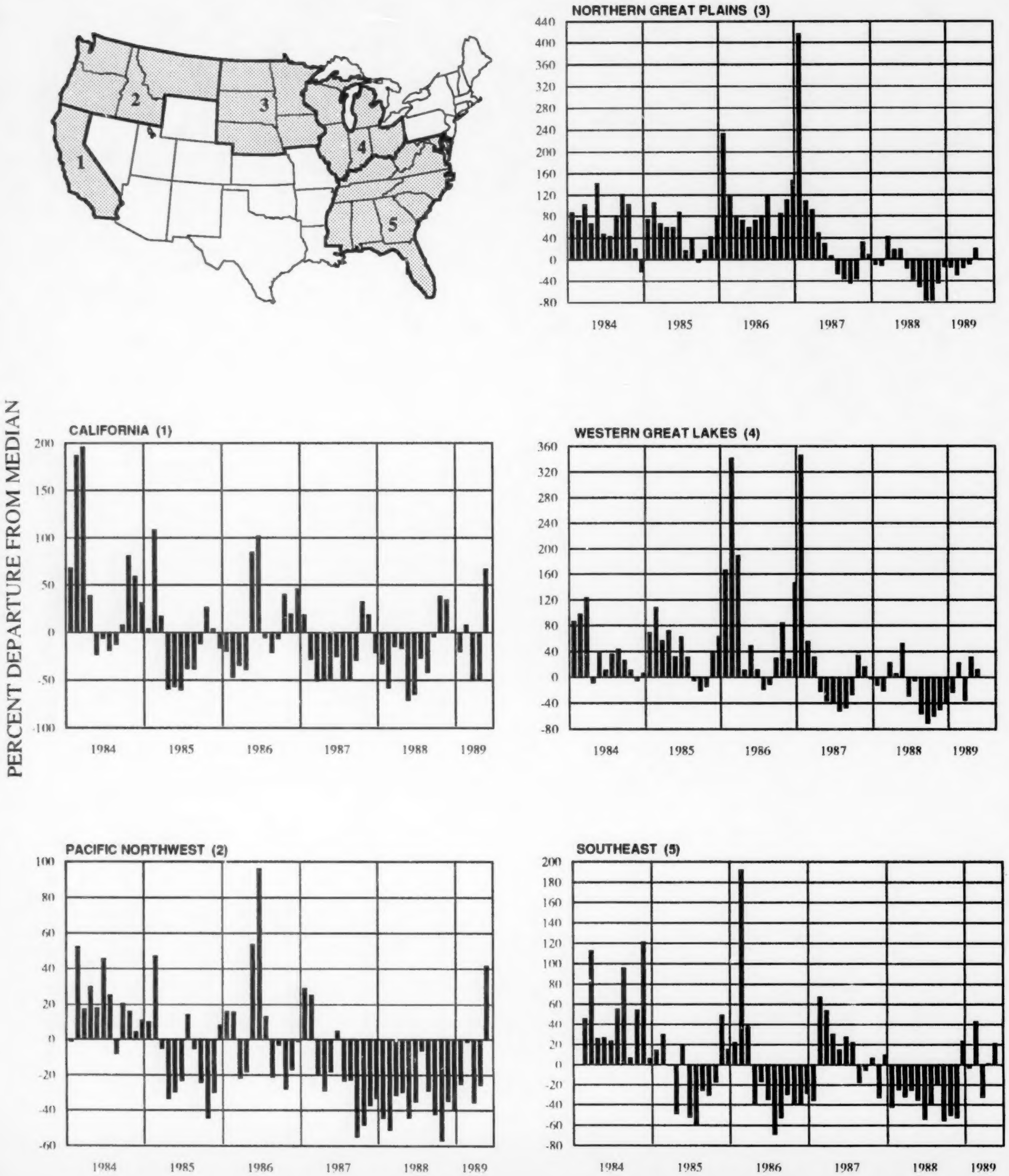




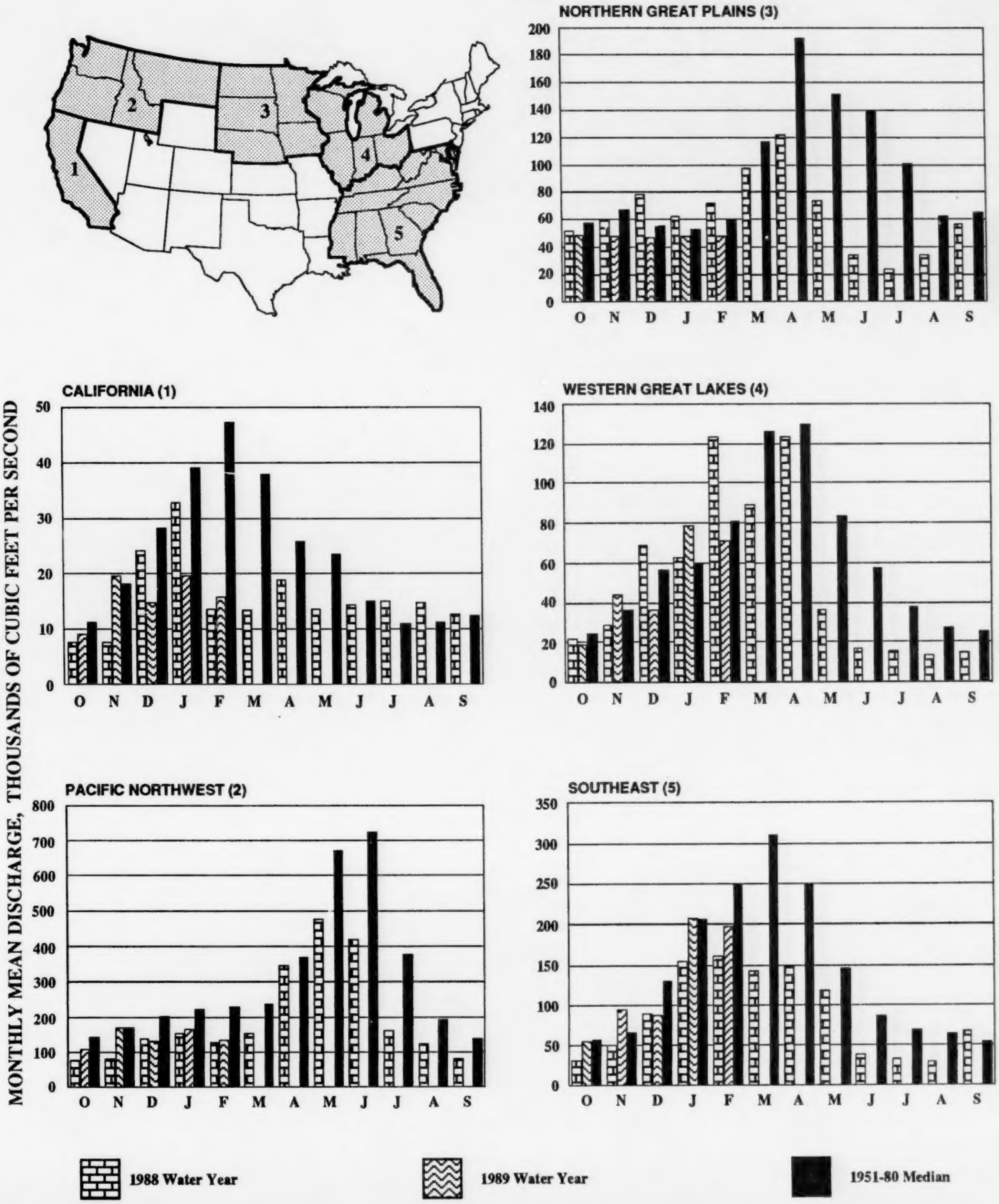




MONTHLY DEPARTURE OF ACTUAL STREAMFLOW (OCTOBER 1983-FEBRUARY 1989) FROM MEDIAN STREAMFLOW (1951-80)

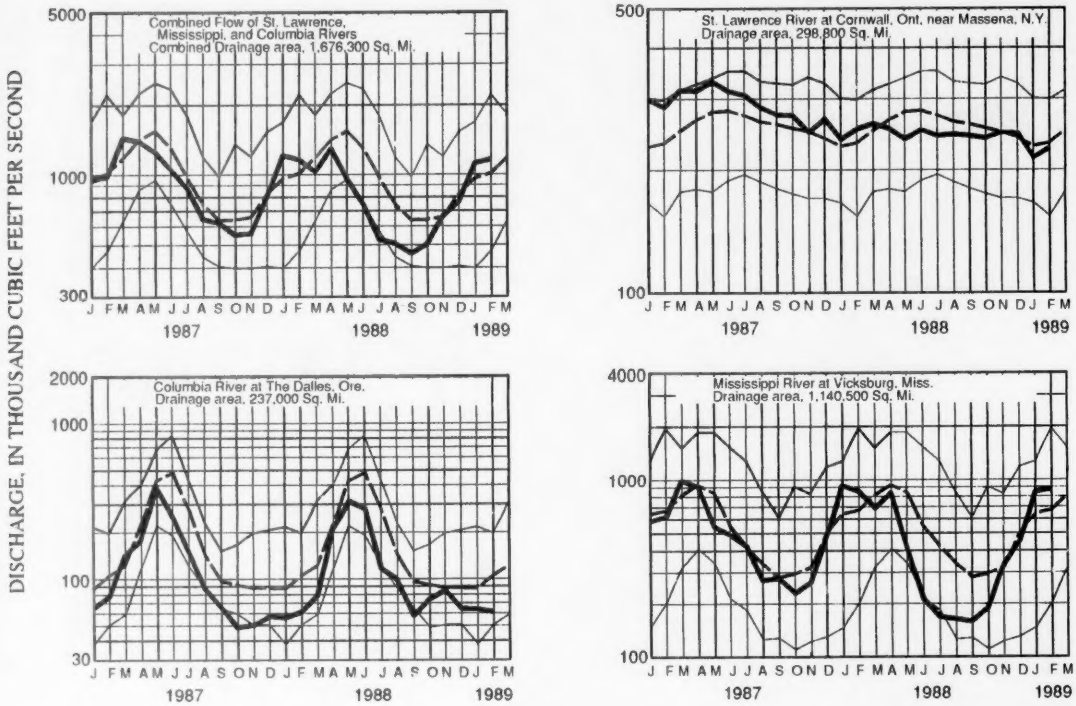


ACTUAL MONTHLY STREAMFLOW, 1988 AND 1989 WATER YEARS, COMPARED WITH MEDIAN MONTHLY STREAMFLOW, 1951-80



HYDROGRAPHS FOR THE "BIG THREE" RIVERS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period.



Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, FOR FEBRUARY 1989, AT DOWNSTREAM SITES ON FIVE LARGE RIVERS

Station number	Station name	February data of following calendar years	Stream discharge during month	Dissolved-solids concentration[a]		Dissolved-solids discharge[a]			Water temperature[b]		
			Mean (cfs)	Minimum (mg/L)	Maximum (mg/L)	Mean (tons per day)	Minimum (tons per day)	Maximum (tons per day)	Mean in °C	Minimum in °C	Maximum in °C
01463500	Delaware River at Trenton, N.J. (Morrisville, Pa.)	1989	6,566	96	134	2,022	1,212	5,548	3.0	0.5	5.5
		1945-88	13,520	61	144	----	647	15,600	---	0.0	8.5
		(Extreme yr)		(1954)	(1977)		(1976)	(1984)			
			[c]12,240								
07289000	Mississippi River at Vicksburg, Miss.	1989	875,500	153	202	416,400	329,000	547,600	7.5	6.0	11.0
		1976-88	645,800	155	288	363,600	108,000	628,200	5.0	0.0	10.5
		(Extreme yr)		(1982)	(1986)		(1977)	(1986)			
			[c]672,800								
03612500	Ohio River at lock and dam 53, near Grand Chain, Ill. (streamflow station at Metropolis, Ill.)	1989	635,900	130	224	----	154,000	341,000	---	4.5	6.0
		1955-88	431,800	98	308	----	44,900	419,000	---	0.0	10.0
		(Extreme yr)		(1957)	(1967)		(1955)	(1974)			
			[c]410,900								
06934500	Missouri River at Hermann, Mo. (60 miles west of St. Louis, Mo.)	1989	38,700	374	490	46,600	34,000	66,000	3.0	0.0	5.5
		1976-88	72,260	205	537	73,690	23,500	237,000	3.5	0.0	12.0
		(Extreme yr)		(1985)	(1985)		(1977)	(1985)			
			[c]49,190								
14128910	Columbia River at Warrendale, Oreg. (streamflow station at The Dalles, Oreg.)	1989	149,000	103	115	44,000	24,500	70,800	1.5	1.0	5.0
		1976-88	166,500	87	128	51,500	24,800	106,500	4.0	0.5	7.0
		(Extreme yr)		(1976)	(1977 1986)		(1977)	(1982)			
			[c]104,800								

[a]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951-80, for comparison with data for current month.

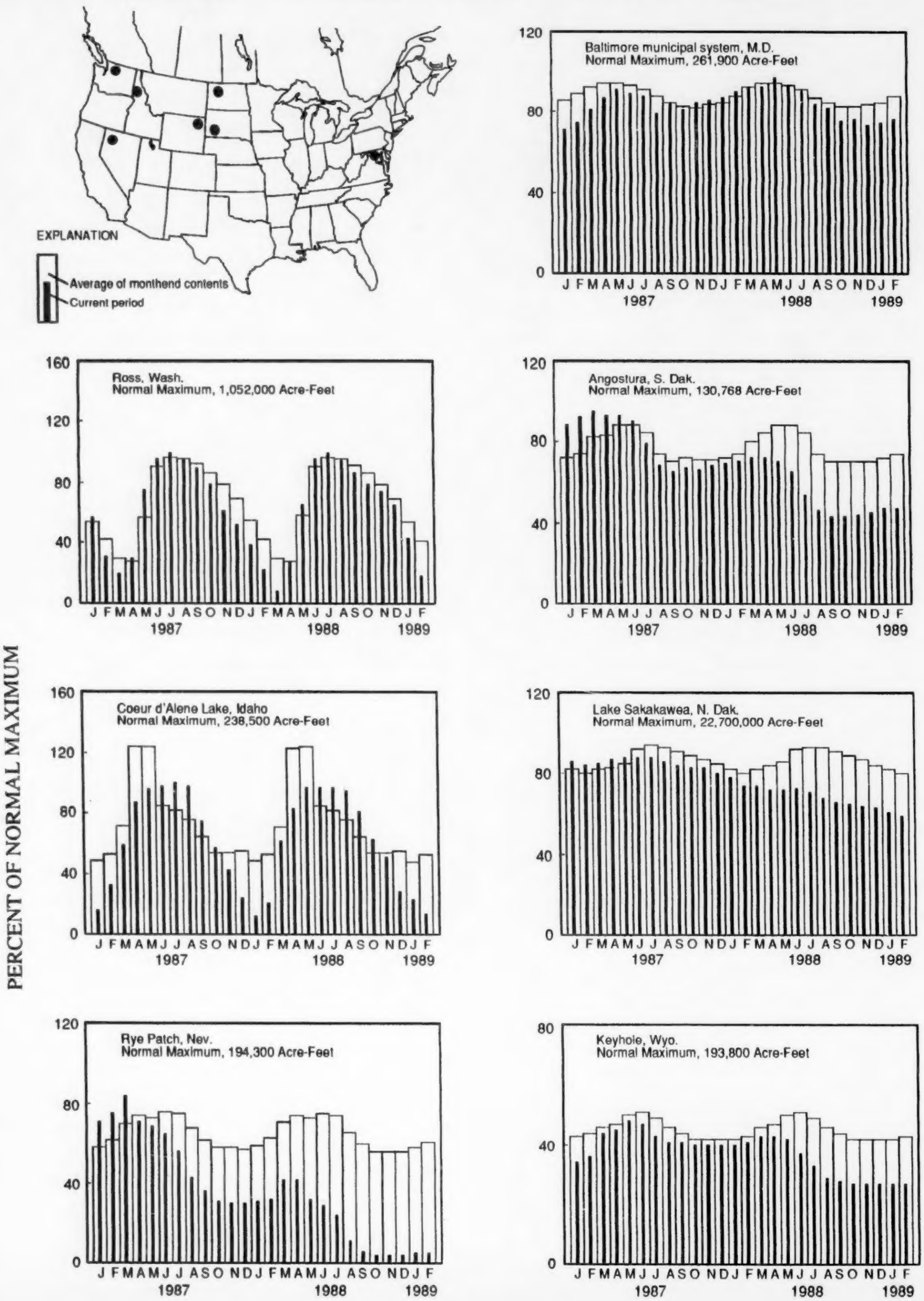
Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING FEBRUARY 1989

Station number	Stream and place of determination	Drainage area (square miles)	Average discharge through September 1980 (cubic feet per second)	February 1989: Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge 1951-80	Change in discharge from previous month (percent)	Discharge near end of month: Cubic feet per second	Discharge near end of month: Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,690	9,647	1,510	77	−30	1,400	900	28
01318500	Hudson River at Hadley, N.Y.	1,664	2,909	900	53	0	960	620	28
01357500	Mohawk River at Cohoes, N.Y.	3,456	5,734	3,680	74	+40	2,600	1,680	28
01463500	Delaware River at Trenton, N.J.	6,780	11,750	6,566	54	+26	7,710	4,983	28
01570500	Susquehanna River at Harrisburg, Pa.	24,100	34,530	19,970	49	−20	38,000	24,600	23
01646500	Potomac River near Washington, D.C.	11,560	[1]11,490	[1]7,410	46	−10	9,770	6,314	28
02105500	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	5,005	5,460	61	+96	....	....	..
02131000	Pee Dee River at Peedee, S.C.	8,830	9,851	8,405	55	+23	24,500	15,830	28
02226000	Altamaha River at Doctortown, Ga	13,600	13,880	4,452	20	−12	9,550	6,170	28
02320500	Suwannee River at Branford, Fla	7,880	6,987	2,460	31	−8	2,640	1,710	28
02358000	Apalachicola River at Chattahoochee, Fla.	17,200	22,570	10,250	32	−5	12,800	8,270	27
02467000	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	23,300	46,810	104	−37	46,000	29,700	28
02489500	Pearl River near Bogalusa, La	6,630	9,768	11,220	66	−66	14,200	9,180	28
03049500	Allegheny River at Natrona, Pa	11,410	[1]19,480	[1]22,080	86	+23	49,400	31,930	23
03085000	Monongahela River at Braddock, Pa	7,337	[1]12,510	[1]26,890	146	+49	49,500	31,990	22
03193000	Kanawha River at Kanawha Falls, W.Va.	8,367	12,590	14,930	78	+12	14,100	9,110	27
03234500	Scioto River at Higby, Ohio	5,131	4,547	8,192	114	+8	2,620	1,693	28
03294500	Ohio River at Louisville, Ky.[2]	91,170	11,600	307,900	176	+66	291,000	188,100	27
03377500	Wabash River at Mount Carmel, Ill	28,635	27,220	30,420	82	−8	30,000	19,000	28
03469000	French Broad River below Douglas Dam, Tenn.	4,543	6,798	9,010	88	+27	....	....	..
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,163	3,224	89	+9	2,664	1,721	28
04264331	St. Lawrence River at Cornwall, Ontario - near Massena, N.Y.[3]	298,800	242,700	226,000	97	+5	234,000	151,200	28
02NG001	St. Maurice River at Grand Mere, Quebec	16,300	25,150	9,180	150	+2	26,400	17,060	28
05082500	Red River of the North at Grand Forks, N.Dak.	30,100	2,551	358	32	+27	330	213	27
05133500	Rainy River at Manitou Rapids, Minn	19,400	11,830	11,000	118	−20	9,000	5,800	23
05330000	Minnesota River near Jordan, Minn	16,200	3,402	288	57	+24	295	190	28
05331000	Mississippi River at St. Paul, Minn	36,800	[1]10,610	3,942	80	+14	4,200	2,710	28
05365500	Chippewa River at Chippewa Falls, Wis.	5,600	5,100	2,813	85	+31	2,800	1,810	28
05407000	Wisconsin River at Muscoda, Wis	10,300	8,617	7,164	104	−2	9,000	5,800	28
05446500	Rock River near Joslin, Ill	9,551	5,873	4,020	91	+4	2,500	1,620	28
05474500	Mississippi River at Keokuk, Iowa	119,000	62,620	30,470	73	+8	28,700	18,550	28
06214500	Yellowstone River at Billings, Mont	11,796	7,038	1,710	63	−10	2,080	1,344	28
06934500	Missouri River at Hermann, Mo	524,200	79,490	38,720	79	+4	29,200	18,870	28
07289000	Mississippi River at Vicksburg, Miss.[4]	1,140,500	576,600	875,500	130	+4	1,301,000	840,900	27
07331000	Washita River near Dickson, Okla	7,202	1,368	2,640	641	+283	1,380	891	28
08276500	Rio Grande below Taos Junction Bridge, near Taos, N.Mex.	9,730	725	600	124	+19	710	458	28
09315000	Green River at Green River, Utah	44,850	6,298	2,563	66	+28	....	....	..
11425500	Sacramento River at Verona, Calif	21,257	18,820	11,730	31	−6	....	....	..
13269000	Snake River at Weiser, Idaho	69,200	18,050	14,200	73	+35	15,000	9,700	28
13317000	Salmon River at White Bird, Idaho	13,550	11,250	3,440	75	+7	3,900	2,520	28
13342500	Clearwater River at Spalding, Idaho	9,570	15,480	3,720	38	+2	5,690	3,677	28
14105700	Columbia River at The Dalles, Oreg.[5]	237,000	[1]193,100	[1]61,230	58	−4	98,900	63,920	26
14191000	Willamette River at Salem, Oreg	7,280	[1]23,510	[1]25,570	55	−42	20,580	13,300	27
15515500	Tanana River at Nenana, Alaska	25,600	23,460	6,800	106	−7	6,600	4,270	28
08MF005	Fraser River at Hope, British Columbia.	83,800	96,290	23,900	70	−14	24,680	15,950	28

[1]Adjusted.
[2]Records furnished by Corps of Engineers.
[3]Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y., when adjusted for storage in Lake St. Lawrence.
[4]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5]Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS



Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF FEBRUARY 1989

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

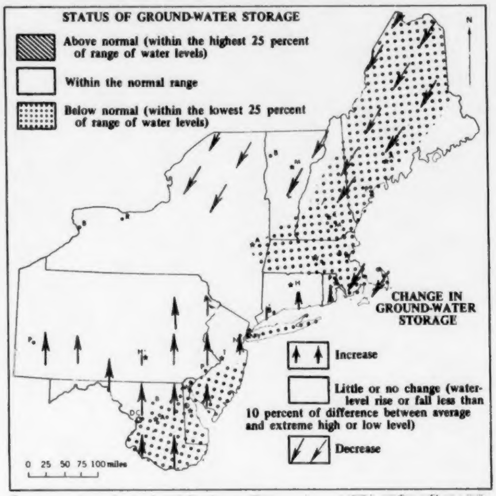
Reservoir Principal uses: F--Flood control I--Irrigation M--Municipal P--Power R--Recreation W--Industrial	Percent of normal maximum: End of Feb. 1989	End of Feb. 1988	Average for end of Feb.	End of Jan. 1989	Normal maximum (acre-feet)[a]
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	51	65	59	65	[b]226,300
QUEBEC					
Allard (P)	18	76	30	43	280,600
Gouin (P)	58	31	52	64	6,954,000
MAINE					
Seven reservoir systems (MP)	34	33	40	46	4,107,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	29	32	20	43	76,450
Lake Francis (FPR)	43	39	31	53	99,310
Lake Winnipesaukee (PR)	56	55	51	55	165,700
VERMONT					
Harriman (P)	48	45	33	56	116,200
Somerset (P)	57	54	51	70	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	76	78	70	76	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	35	35	36	40	786,700
Indian Lake (FMP)	54	52	42	58	103,300
New York City reservoir system(MW)	56	87	83	56	1,680,000
NEW JERSEY					
Wanaque (M)	82	87	80	74	77,450
PENNSYLVANIA					
Allegheny (FPR)	37	25	26	32	1,180,000
Pymatuning (FMR)	91	87	86	88	188,000
Raystown Lake (FR)	68	68	56	68	761,900
Lake Wallenpaupack (PR)	57	56	51	62	157,800
MARYLAND					
Baltimore municipal system (M)	76	90	88	74	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	95	84	84	92	288,800
Narrows (Badin Lake) (P)	100	92	100	93	128,900
High Rock Lake (P)	89	38	74	28	234,800
SOUTH CAROLINA					
Lake Murray (P)	89	85	72	83	1,614,000
Lakes Marion and Moultrie (P)	74	72	76	70	1,862,000
SOUTH CAROLINA--GEORGIA					
Strom Thurmond Lake (FP)	21	43	67	20	1,730,000
GEORGIA					
Burton (PR)	86	67	68	65	104,000
Sinclair (MPR)	92	91	88	90	214,000
Lake Sidney Lanier (FMPR)	41	45	57	38	1,686,000
ALABAMA					
Lake Martin (P)	80	74	76	73	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	50	39	40	46	2,293,000
Douglas Lake (FPR)	27	15	22	16	1,394,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	58	55	50	49	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	54	42	42	47	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	56	44	48	49	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	67	81	28	80	365,000
Wisconsin River (21 reservoirs) (PR)	31	35	19	44	399,000
MINNESOTA					
Mississippi River headwater system (FMR)	27	25	18	33	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	59	74	80	61	22,700,000
SOUTH DAKOTA					
Angostura (I)	47	70	74	47	130,768
Belle Fourche (I)	40	73	54	36	185,200
Lake Francis Case (FIP)	75	73	77	69	4,589,000
Lake Oahe (FIP)	65	84	---	66	22,240,000
Lake Sharpe (FIP)	100	102	99	102	1,697,000
Lewis and Clark Lake (FIP)	83	87	90	100	432,000
NEBRASKA					
Lake McConaughy (IP)	76	79	75	74	1,948,000
OKLAHOMA					
Eufaula (FRP)	103	97	87	102	2,378,000
Keystone (FPR)	88	82	93	87	661,000
Tenkiller Ferry (FPR)	106	103	92	106	628,200
Lake Altus (FIMR)	82	101	52	77	133,000
Lake O'The Cherokees (FPR)	92	90	82	90	1,492,000
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	94	92	88	88	2,722,000
TEXAS					
Bridgeport (IMW)	61	81	48	57	386,400
Canyon (FMR)	98	95	81	98	385,600
International Amistad (FIMPW)	101	101	84	102	3,497,000
International Falcon (FIMPW)	91	107	73	93	2,668,000
Livingston (IMW)	102	103	90	87	1,788,000
Possum Kingdom (IMPRW)	71	66	94	70	570,200
Red Bluff (PI)	60	73	32	58	307,000
Toledo Bend (P)	92	91	87	89	4,472,000
Twin Buttes (FIM)	74	84	34	71	177,800
Lake Kemp (IMW)	63	87	86	60	268,000
Lake Meredith (FWM)	41	36	36	...	796,900
Lake Travis (FIMPRW)	83	97	82	...	1,144,000
MONTANA					
Canyon Ferry (FIMPR)	62	71	78	67	2,043,000
Fort Peck (FPR)	64	78	81	66	18,910,000
Hungry Horse (FIPR)	38	41	64	44	3,451,000
WASHINGTON					
Ross (PR)	18	22	41	43	1,052,000
Franklin D. Roosevelt Lake (IP)	26	65	69	39	5,022,000
Lake Chelan (PR)	36	14	36	47	676,100
Lake Cushman (PR)	46	55	83	38	359,500
Lake Merwin (P)	99	101	96	99	245,600
IDAHO					
Boise River (4 reservoirs) (FIP)	36	38	63	32	1,235,000
Coeur d'Alene Lake (P)	14	21	53	23	238,500
Pend Oreille Lake (FP)	30	29	52	29	1,561,000
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	48	59	70	41	4,401,000
WYOMING					
Boysen (FIP)	63	71	67	62	802,000
Buffalo Bill (IP)	40	47	62	38	421,300
Keyhole (F)	27	41	43	27	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs(I)	55	60	52	54	3,056,000
COLORADO					
John Martin (FIR)	33	82	23	30	364,400
Taylor Park (IR)	62	71	56	64	106,200
Colorado-Big Thompson project (I)	65	69	58	65	730,300
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	81	84	---	82	31,620,000
UTAH--IDAHO					
Bear Lake (IPR)	58	73	59	57	1,421,000
CALIFORNIA					
Folsom (FIP)	38	44	59	31	1,000,000
Hetch Hetchy (MP)	28	39	30	33	360,400
Isabella (FIR)	13	24	31	13	568,100
Pine Flat (FI)	15	28	57	12	1,001,000
Clair Engle Lake (Lewiston) (P)	53	72	79	52	2,438,000
Lake Almanor (P)	66	71	54	66	1,036,000
Lake Berryessa (FIMW)	60	62	87	62	1,600,000
Millerton Lake (FI)	46	45	66	43	503,200
Shasta Lake (FIPR)	43	81	76	43	4,377,000
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	0	29	54	0	744,600
NEVADA					
Rye Patch (I)	5	32	61	5	194,300
ARIZONA--NEVADA					
Lake Mead and Lake Mohave(FIMP)	89	94	70	89	27,970,000
ARIZONA					
San Carlos (IP)	48	60	29	49	935,100
Salt and Verde River system(IMPR)	81	90	49	65	2,019,100
NEW MEXICO					
Conchas (FIR)	81	88	80	82	315,700
Elephant Butte and Caballo (FIPR)	88	97	38	87	2,442,000

[a] 1 acre-foot = 0.04356 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second day.
[b] Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

GROUND-WATER CONDITIONS DURING FEBRUARY 1989

Ground-water levels continued the general areal pattern of up and down trends of the previous month, mainly declinning in three northern parts of the Northeast and continuing to rise in the southern part of the region. (See map.) Also, the areal distribution of below-average water levels near the end of February was very similar to that existing at the end of January--most of central and northern New England, Long Island, New York, southern New Jersey, eastern Maryland, and most of Delaware. Elsewhere, water levels in most observation wells were within the range of water levels normally occurring near the end of February.

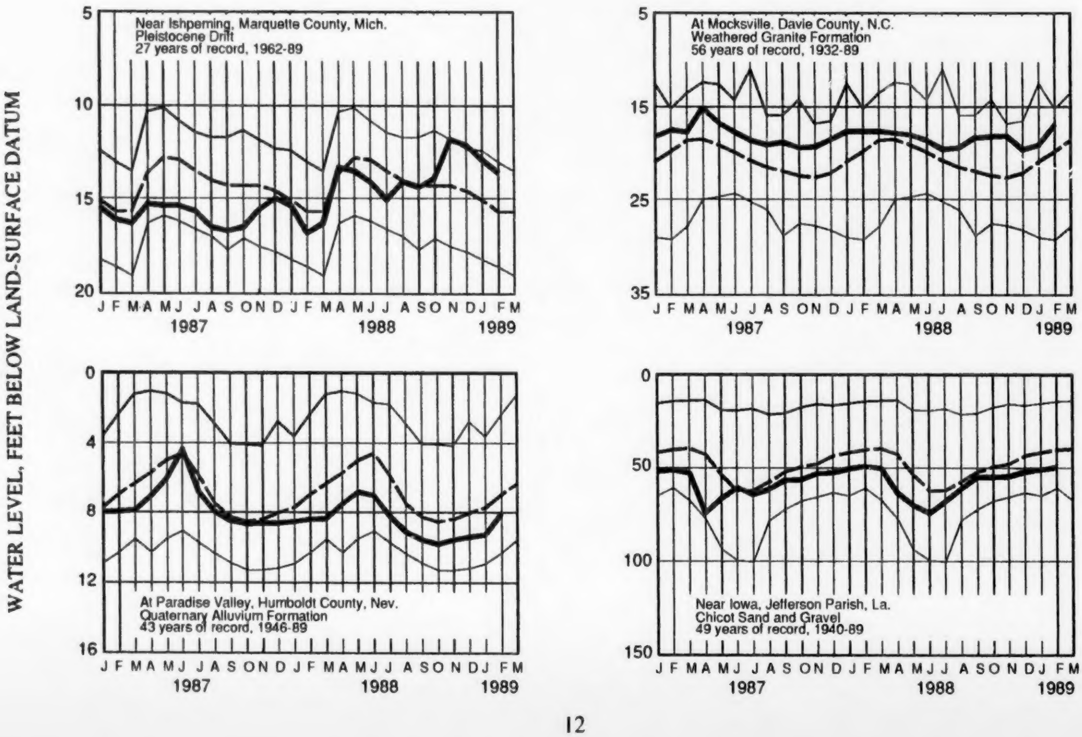
In the Southeastern States, ground-water levels rose in Kentucky, North Carolina, Louisiana, and in most wells in Virginia. Net changes in levels were mixed in West Virginia, Arkansas, and Georgia. Levels declined in South Carolina. Water levels were avove long-term averages in Kentucky, and mixed with respect to average in West Virginia and North Carolina. Levels were below average in Arkansas and Louisiana, and also in most wells in Virginia and Florida. The level in the key well in Viola County, Kentucky, rose to a new February high, and the level in the well in Montgomery, Alabama, declined to a new February low. Despite net rises in levels during the month, new February lows also were established in key wells in McGaheysville, Rockingham County, Virginia; Memphis, in western Tennessee; Stuttgart, in east-central Arkansas; and in Ruston, in northern Louisiana.



Map showing ground-water storage near end of February and change in ground-water storage from end of Januaryr to end of February.

MONTHEND GROUND-WATER LEVELS IN KEY WELLS

Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.



In the central and western Great Lakes States, ground-water levels rose in Ohio, declined in Michigan, and changed variably in Minnesota and Iowa. Levels were above long-term averages in Michigan, below average in Iowa, and mixed with respect to average in Minnesota and Ohio. A new low for February occurred in the index well at Camp Ripley in north-central Minnesota.

In the Western States, ground-water levels rose in Arizona and declined in Idaho and North Dakota. Mixed water-level changes occurred in Washington, Nebraska, southern California, Nevada, Utah, New Mexico, and Texas. Water-levels were mixed with respect to long-term averages in Washington, Nebraska, southern California, Nevada, Utah, and New Mexico. Levels were below average in Idaho, North Dakota, Arizona, and Texas. A new February high occurred in the key well in the Blanding area in Utah. New February lows occurred in key wells in the Boise Valley in Idaho; in the Las Vegas Valley in Nevada; in the Logan area in Utah; and in Kansas, in the Harvey County well and in the well at the Kansas Agricultural Experiment Station in Colby. A new February low also occurred in the key well in El Paso, in western Texas, despite a net rise in level during the month. A new all-time high ground-water level occurred in the Berrendo-Smith key well in the Roswell artesian basin in New Mexico (23 years of record). A new all-time low level occurred in the key observation well at Wyndmere, in Richland County, North Dakota (25 years of record).

Provisional data; subject to revision

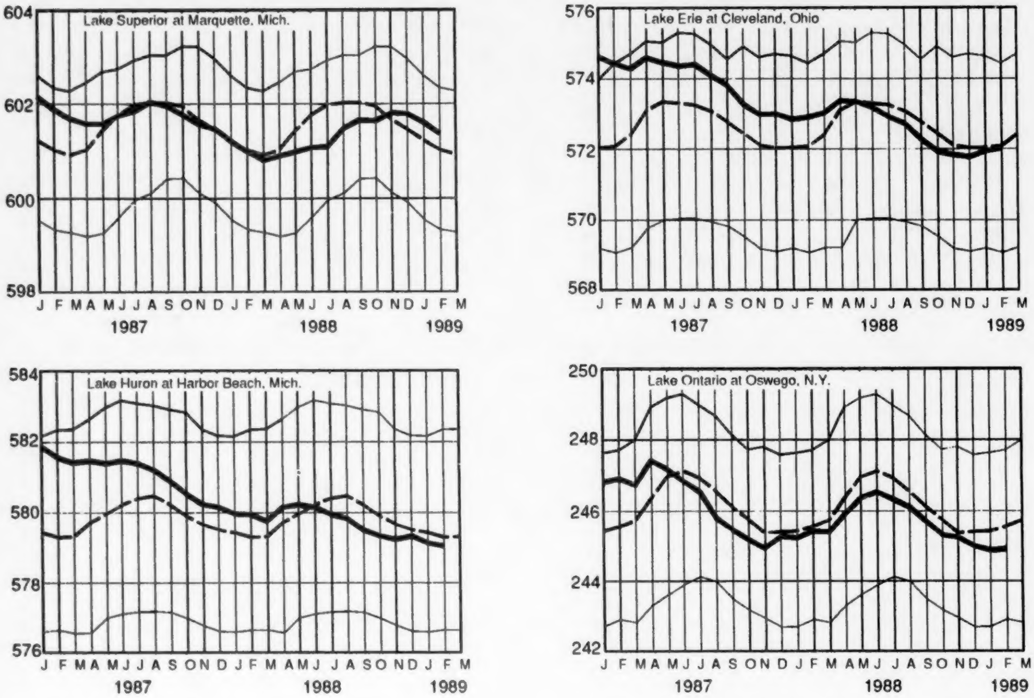
WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES--FEBRUARY 1989

Aquifer and Location	Water level in feet with reference to land-surface datum	Departure from average in feet	Net change in water level in feet since: Last month	Last year	Year records began	Remarks
Glacial drift at Hanska, south-central Minnesota	-14.14	-5.25	-1.50	-0.09	1942	
Glacial drift at Roscommon in north-central part of Lower Peninsula, Michigan.	-4.69	+0.27	-0.24	+0.15	1935	
Glacial drift at Marion, Iowa	-8.06	-2.31	+0.03	-3.98	1941	
Glacial drift at Princeton in northwestern Illinois	-8.20	+4.11	+0.05	-2.35	1943	
Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia.	-15.86	-1.09	+1.28	-0.54	1939	
Glacial outwash sand and gravel, Louisville, Kentucky (U.S. well no. 2).	-20.19	+4.86	-0.48	-0.57	1946	
500-foot sand aquifer near Memphis, Tennessee (U.S. well no. 2).	-106.40	-16.51	+0.14	-0.36	1941	Feb. low.
Weathered granite, Mocksville area, Davie County, western Piedmont, North Carolina.	-16.93	+2.56	+1.22	+0.67	1932	
Sparta Sand in Pine Bluff industrial area, Arkansas	-241.60	-32.39	+2.90	-7.50	1958	
Eutaw Formation in the City of Montgomery, Alabama (U.S. well no. 4).	-28.2	-8.7	-0.6	-2.8	1952	Feb. low.
Upper Floridan aquifer on Cockspur Island, Savannah area, Georgia (U.S. well no. 6).	-34.00	-7.87	-0.29	+0.53	1956	
Sand and gravel in Puget Trough, Tacoma, Washington.	-103.90	+3.73	+0.76	-1.04	1952	
Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3).	-470.4	-8.4	-0.5	-2.7	1929	
Snake River Group: Snake River Plain Aquifer, at Eden, Idaho (U.S. well no. 4).	-127.2	-6.7	-1.3	-3.7	1957	
Alluvial valley fill in Flowell area, Millard County, Utah (U.S. well no. 9).	-17.85	+5.80	+1.34	-2.23	1929	
Alluvial sand and gravel, Platte River Valley, Ashland, Nebraska (U.S. well no. 6).	-7.45	-2.19	+0.29	-2.37	1935	
Alluvial valley fill in Steptoe Valley, Nevada	-6.67	+5.56	+0.26	-0.12	1950	
Pleistocene terrace deposits in Kansas River valley, at Lawrence, northeastern Kansas.	-23.48	-2.42	+0.01	-3.14	1953	
Alluvium and Paso Robles clay, sand, and gravel, Santa Maria Valley, California.	-142.40	+0.41	+0.85	-12.65	1957	
Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15).	-100.24	-19.39	+0.16	+1.96	1951	
Hueco bolson, El Paso area, Texas	-268.55	-20.46	+0.19	-2.13	1965	Feb. low.
Evangeline aquifer, Houston area, Texas	-300.33	-2.84	+1.97	-3.83	1965	

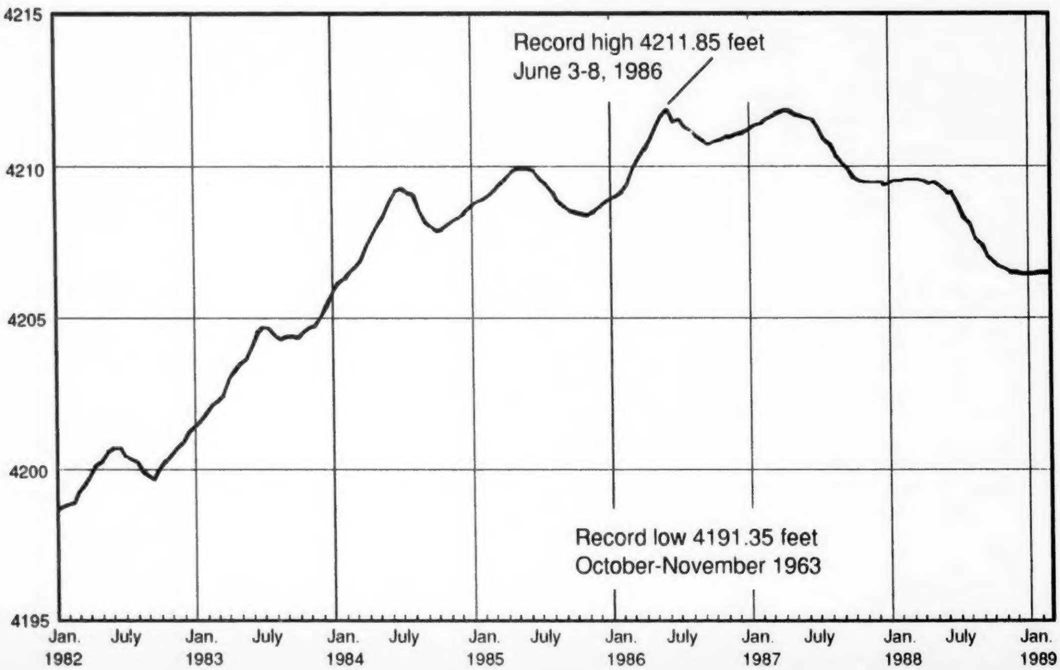
GREAT LAKES ELEVATIONS

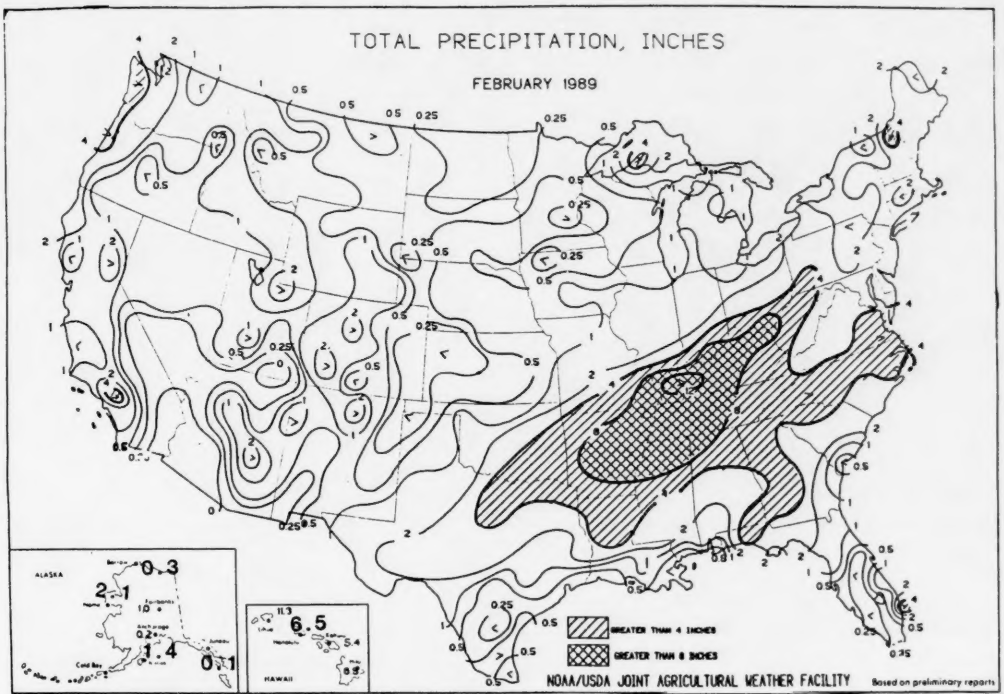
Area between light-weight solid lines indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951-80. Heavy line indicates mean for current period. Data from National Ocean Service.

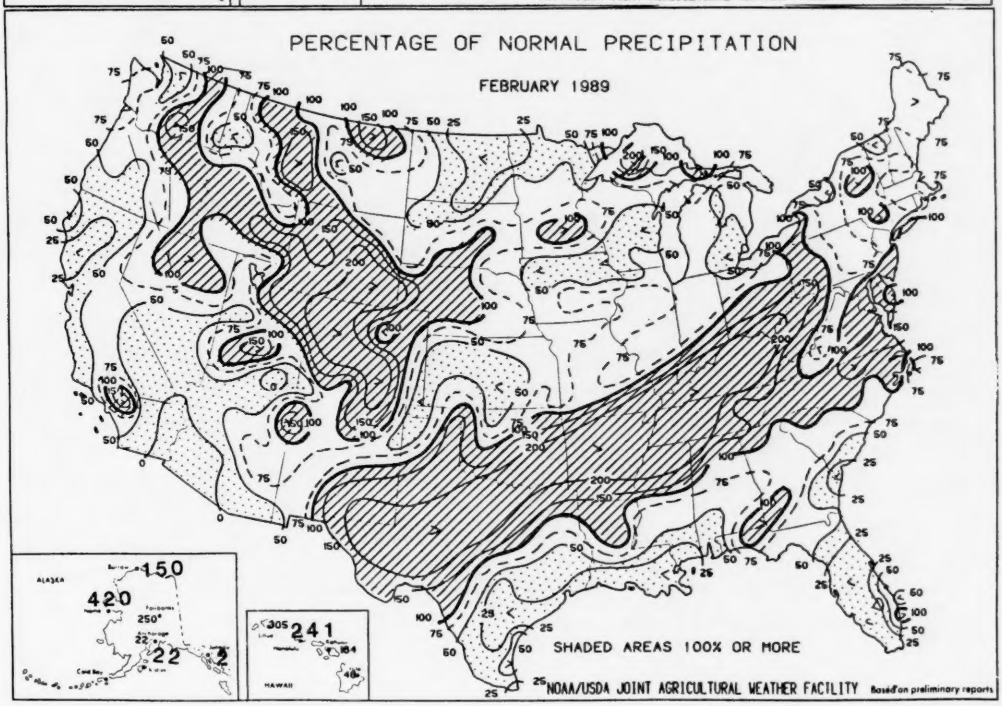
ELEVATION, IN FEET ABOVE NATIONAL GEODETIC VERTICAL DATUM OF 1929



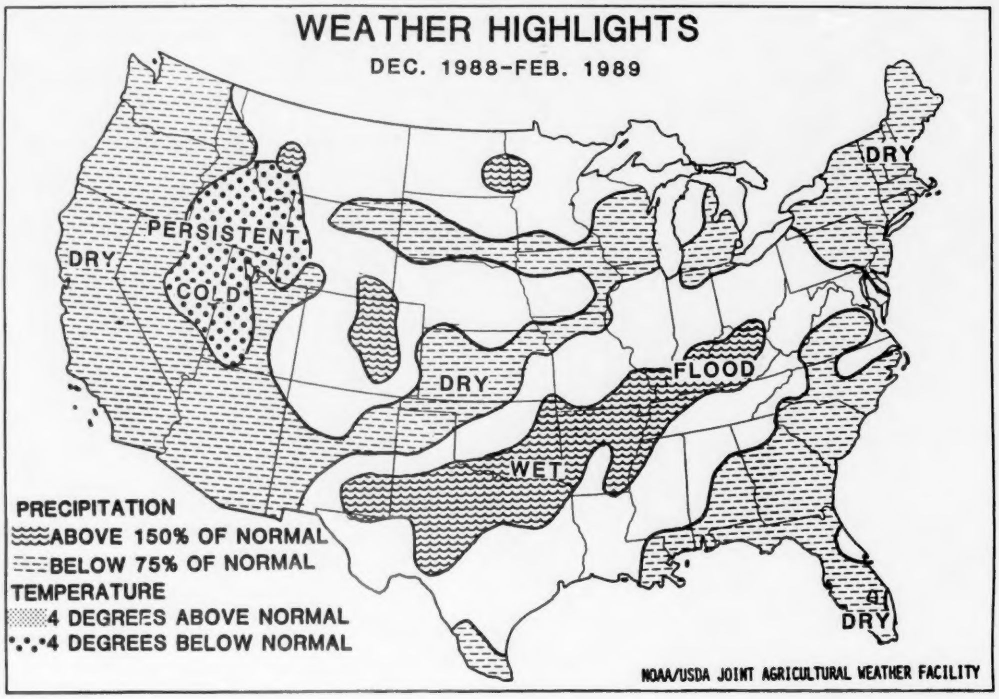
Fluctuations of Great Salt Lake, January 1982 through February 1989







(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Weather Facility)



Winter Weather Review

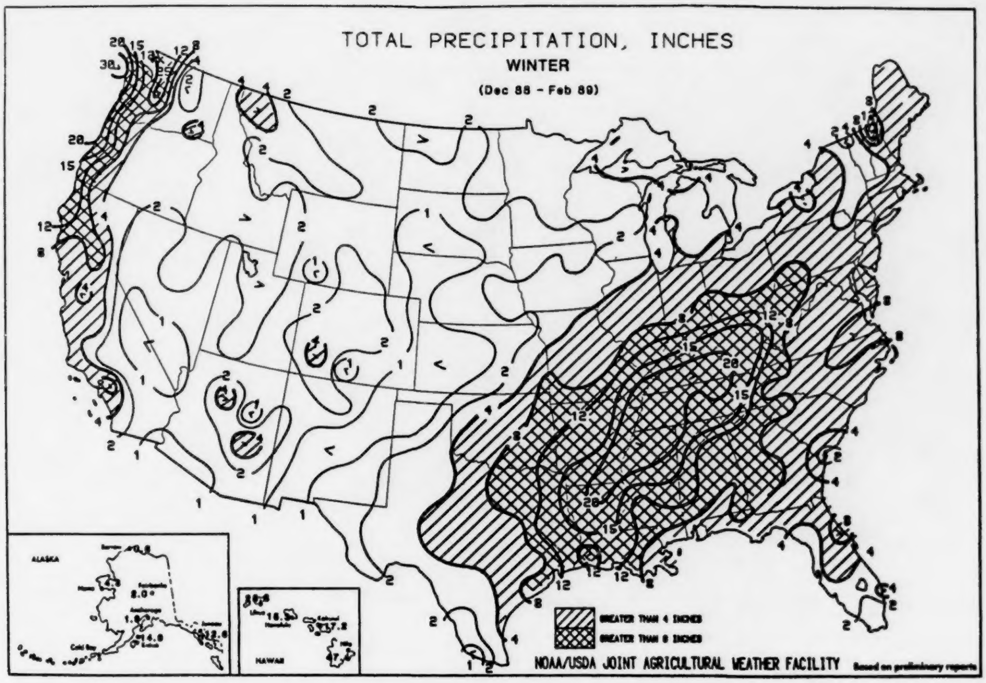
HIGHLIGHTS: The winter of 1988-89 was unusually mild and dry in large parts of the country. Nationally, it was the 9th driest winter since records began in 1895, with much of the Northeast and south Atlantic regions recording less than 50 percent of normal precipitation. The Northeast had its third driest winter of record. Burlington, Vermont, measured just under 2 inches of precipitation for the entire 3-month period. Precipitation was also well below normal in some important wheat growing areas of the Great Plains, as well as in southeast Texas and most of the Pacific States. Wheat growing areas of central and western Kansas recorded less than 1 inch of precipitation. The third consecutive year of below-average precipitation threatened irrigation water supplies in California. In contrast, precipitation was above normal in some of the northern Plains areas affected by extreme dryness last spring and summer. Unusually wet weather extended in a broad band from central Texas northeastward through the Tennessee and Ohio Valleys. Temperatures were above normal east of the Continental Divide and below normal in the West, but record cold covered Alaska during the second half of January and plunged southward into the contiguous United States during the first week of February. Temperatures as low as -50 degrees were the lowest recorded in the last 4 years.

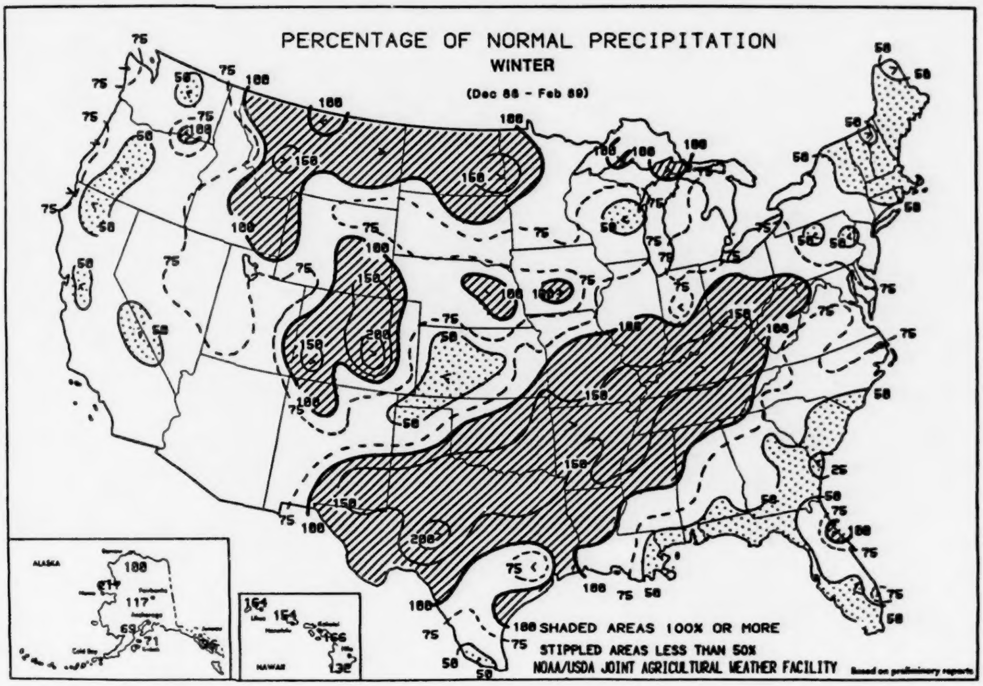
DECEMBER: Dryness prevailed across the winter wheat areas of the Great Plains and along the southern Atlantic seaboard. Precipitation totaled less than one-quarter of an inch in western portions of Nebraska, Kansas, and Oklahoma. Dryness also occurred over the northern Atlantic seaboard, the western Corn Belt, and the interior of the Pacific Northwest. Winter storms brought near- to above-normal precipitation into most of the Mississippi and Ohio Valleys. Heavy snow fell in the northern and central Rockies. Cold weather prevailed over the northern and central Intermountain Plateau, while above-normal temperatures persisted in the central and southern Great Plains.

JANUARY: Mild weather dominated much of the Nation, particularly the Corn Belt, where temperatures were as much as 14 degrees above normal. Temperatures were especially high in the Northwest and eastern two-thirds of the country during the latter part of the month. Nationally, 1989 had the second warmest January in the last 35 years. In contrast, abnormally cold weather settled over the Great Basin and Alaska. Official readings dipped to as low as -76 degrees in Alaska, which is just 5 degrees higher than the all-time record for the continent. The cold mass of air did set a new record for the highest pressure ever observed in North America, 31.85 inches. Precipitation was above normal across large areas of Nebraska, Kansas, and Oklahoma, bringing some relief to the winter wheat crop. Wet weather again extended from Texas northeastward to the Ohio Valley. The South Atlantic region and New England remained dry.

FEBRUARY: Bitter arctic air poured into the Central States during the first few days of the month and then spread outward to cover much of the Nation by February 6. Scores of temperature records were broken during the first 9 days of the month, as readings dropped to -30 degrees or lower in the northern Plains, the central and northern Rockies, and even the Great Basin. The media blamed at least 65 deaths on the weather, which also took its toll on livestock and crops. Winter grains that lacked sufficient snow cover sustained freeze damage as thermometers dipped to -10 or lower in the central Plains and the Pacific Northwest. For the month as a whole, only the Eastern seaboard and the Southwest averaged above-normal temperatures. Nationally, this February was the 8th coldest since 1895. Below-normal precipitation occurred on the West coast, the central Plains, and along the Gulf coast. Southern Florida registered its driest September-February period ever. Once again, unusually wet weather prevailed in a wide zone extending from central Texas northeastward into the Ohio Valley.

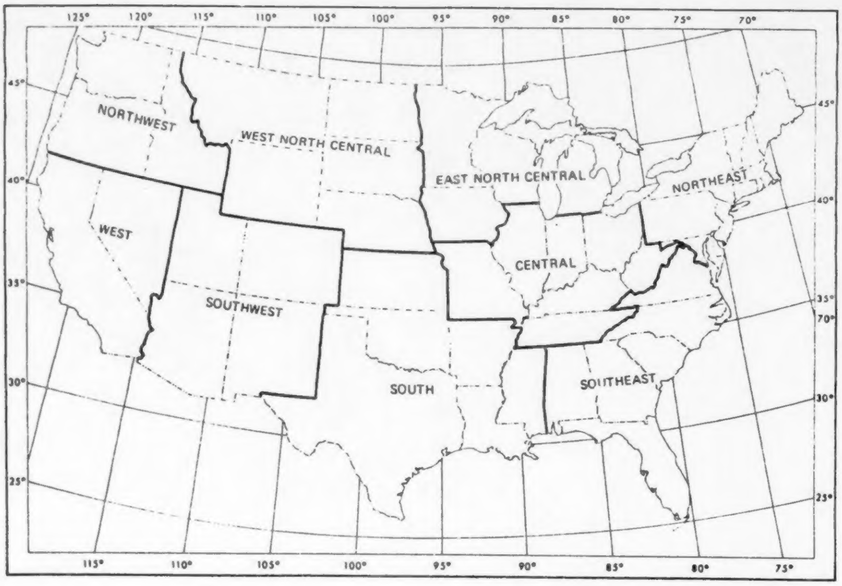
(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Weather Facility)





(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Weather Facility)

COMPARATIVE WEATHER DATA FOR FEBRUARY



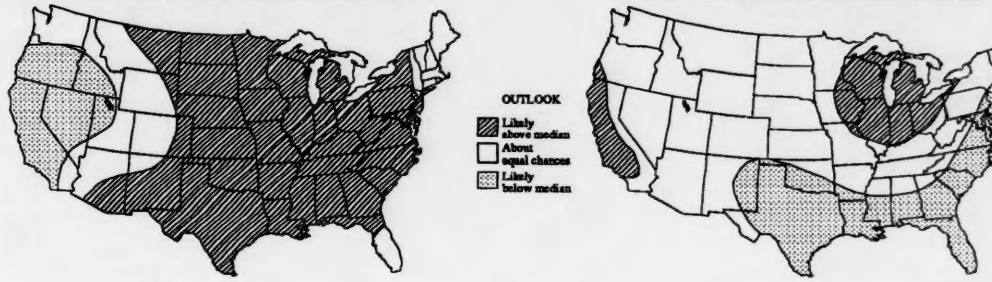
Temperature and Precipitation Rankings for
February 1989, based on the period 1895-1989.
1 = coldest/driest, 95 = warmest/wettest

Region	Temperature	Precipitation
National	8	36
Northeast	44	27
East North Central	11	15
Central	19	84
Southeast	60	23
West North Central	3	42
South	9	57
Southwest	21	55
Northwest	1	23
West	13	22

(From *Weekly Weather and Crop Bulletin* prepared and published by the NOAA/USDA Joint Agricultural Weather Facility)

TEMPERATURE OUTLOOK FOR MARCH THROUGH MAY 1989

PRECIPITATION OUTLOOK FOR MARCH THROUGH MAY 1989



NATIONAL WATER CONDITIONS

FEBRUARY 1989

Based on reports from the Canadian and U.S. Field offices; completed March 23, 1989

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EXPLANATION OF DATA (Revised February 1989)

Cover map shows generalized pattern of streamflow for the month based on provisional data from 183 index gaging stations—18 in Canada, 163 in the United States, and 2 in the Commonwealth of Puerto Rico. Alaska, Hawaii, and Puerto Rico inset maps show streamflow only at the index gaging stations that are located near the point shown by the arrows. Classifications on map are based on comparison of streamflow for the current month at each index station with the flow for the same month in the 30-year reference period, 1951-80. Shorter reference periods are used for one Canadian index station, two Kansas index stations, one New York index station, and the Puerto Rico index stations because of the limited records available.

The ***streamflow ranges map*** shows where streamflow has persisted in the above- or below-normal range from last month to this month and also where streamflow is in the above- or below-normal range this month after being in a different range last month. Three ***pie charts*** show: the percent of stations reporting discharges in each flow range for both the conterminous United States and southern Canada, and also the percent of area in each flow range for the conterminous United States and southern Canada. The bar graph shows total mean and total median flow for all reporting stations in the conterminous United States and southern Canada.

The comparative data are obtained by ranking the 30 flows for each month of the reference period in order of decreasing magnitude—the highest flow is given a ranking of 1 and the lowest flow is given a ranking of 30. Quartiles (25-percent points) are computed by averaging the 7th and 8th highest flows (upper quartile), 15th and 16th highest flows (middle quartile and median), and the 23rd and 24th highest flows (lower quartile). The upper and lower quartiles set off the highest 25 percent of flows and lowest 25 percent of flows, respectively, for the reference period. The median (middle quartile) is the middle value by definition. For the reference period, 50 percent of the flows are greater than the median, 50 percent are less than the median, 50 percent are between the upper and lower quartiles (in the normal range), 25 percent are greater than the upper quartile (above normal), and 25 percent are less than the lower quartile (below normal). Flow for the current month is then classified as: in the ***above-normal range*** if it is greater than the upper quartile, in the ***normal range*** if it is between the upper and lower quartiles, and in the ***below-normal range*** if it is less than the lower quartile. Change in flow from the previous month to the current month is classified as ***seasonal*** if the change is in the same direction as the change in the median. If the change is in the opposite direction of the change in the median, the change is classified as ***contraseasonal*** (opposite to the seasonal change). For example: at a particular index station, the January median is greater than the December median; if flow for the current January increased from December (the previous month), the increase is seasonal; if flow for the current January decreased from December, the decrease is contraseasonal.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. ***Probability of occurrence*** is the chance that a given flood magnitude will be exceeded in any one year. ***Recurrence interval*** is the reciprocal of probability of occurrence and is the average number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. ***Recurrence intervals imply no regularity of occurrence***; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about ***ground-water levels*** refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the 30-year reference period, 1951-80, or from the entire past record for that well when only limited records are available. Comparative data for ground-water levels are obtained in the same manner as comparative data for streamflow. ***Changes in ground-water levels***, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data are given for five stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). ***Dissolved solids*** are minerals dissolved in water and usually consist predominately of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. ***Dissolved-solids discharge*** represents the total daily amount of dissolved minerals carried by the stream. ***Dissolved-solids concentrations*** are generally higher during periods of low streamflow, but the highest dissolved-solids discharges occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at times of low flow.

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